IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant	: Sohrab Amirghodsi	Art Unit	: 2624
Serial No.	: 10/714,514	Examiner	: Randolph I. Chu
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Title	: IMAGE RESAMPLING USING VARIABLE QUANTIZATION BINS		

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BRIEF ON APPEAL UNDER 37 CFR §41.37

This Brief on Appeal perfects the Notice of Appeal filed January 7, 2008.

(1) Real Party in Interest

This application is assigned of record to Adobe Systems Incorporated, who is the real party in interest.

(2) Related Appeals and Interferences

There are no known related appeals and/or interferences.

(3) Status of Claims

Claims 1-22, 26-44, and 47-69 are pending. Claims 23-25, 45, and 46 have been canceled. Claims 1, 18, 26, and 42-44 are the independent claims. Claims 1-22, 26-44, and 47-69 stand rejected. The rejection of claims 1-22, 26-44, and 47-69 is appealed.

(4) Status of Amendments

No claim amendments have been filed after final rejection.

(5) Summary of Claimed Subject Matter

Claim 1

Claim Language	Support in Specification and Figures
A method for resampling a first image sampled on a first sample grid comprising:	*See, e.g.,* para. [07] (pg. 2, ll. 6-11); para. [039] (pg. 6, ll. 22-29); para. [040] (pg. 6, l. 30 – pg. 7, l. 5); para. [046] (pg. 8, ll. 10-18); para. [051] (pg. 9, l. 31 – pg. 10, l. 5); and para. [064] (pg. 13, ll. 12-23).
computing a filter for applying to the first image, including computing a spatially quantized representation of the filter wherein a degree of spatial quantization of the filter depends on one or more factors including a measure of scale relating the first sample grid and a desired sample grid; and	*See, e.g.,* para. [07] (pg. 2, ll. 6-11); para. [012] (pg. 2, ll. 20-23); para. [018] (pg. 3, ll. 11-16); para. [019] (pg. 3, ll. 17-22); para. [048] (pg. 8, l. 32 – pg. 9, l. 11); para. [051] (pg. 9, l. 31 – pg. 10, l. 5); para. [052] (pg. 10, ll. 6-12); para. [053] (pg. 10, ll. 13-18); para. [056] (pg. 10, l. 32 – pg. 11, l. 10); and para. [066] (pg. 14, ll. 1-5).
storing the spatially quantized representation of the filter in a data structure comprising a location array that includes a plurality of elements representing fractional pixel locations based on a spatial quantization factor, wherein each element of the location array points to a sample array of filter values.	*See, e.g.,* para. [048] (pg. 8, l. 32 – pg. 9, l. 11); para. [051] (pg. 9, l. 31 – pg. 10, l. 5); para. [065] (pg. 13, ll. 24-33); para. [068] (pg. 14, ll. 13-28); para. [073] (pg. 16, ll. 4-19); and FIG. 4C, numerals 450, 460, and 462.

Claim 5

Claim Language	Support in Specification and Figures
The method of claim 4 wherein computing the spatially quantized representation of the filter includes computing values of the filter each associated with one of a number of equal spatial domains of the filter.	*See, e.g.,* para. [012] (pg. 2, ll. 20-23); para. [048] (pg. 8, l. 32 – pg. 9, l. 11); and FIG. 4B, numeral 420.

Claim 14

Claim Language	Support in Specification and Figures
The method of claim 1 wherein the degree of spatial quantization of the filter depends on factors that further include characteristics of a computation device for performing the resampling.	*See, e.g.,* para. [017] (pg. 3, ll. 7-10); para. [035] (pg. 5, ll.10-22); para. [036] (para. 5, ll. 23-29); para. [063] (pg. 13, ll. 3-11); para. [066] (pg. 14, ll. 1-5); and FIG. 1, numeral 124.

Claim 17

Claim Language	Support in Specification and Figures
The method of claim 14 wherein the characteristics of the computational device include a processor characteristic.	*See, e.g.,* para. [017] (pg. 3, ll. 7-10); para. [035] (pg. 5, ll.10-22); para. [036] (para. 5, ll. 23-29); para. [063] (pg. 13, ll. 3-11); para. [066] (pg. 14, ll. 1-5); and FIG. 1, numeral 124.

Claim 18

Claim Language	Support in Specification and Figures
A method for resampling a first image sampled on a first sample grid comprising:	*See, e.g.,* para. [07] (pg. 2, ll. 6-11); para. [039] (pg. 6, ll. 22-29); para. [040] (pg. 6, l. 30 – pg.

	7, l. 5); para. [046] (pg. 8, ll. 10-18); para. [051] (pg. 9, l. 31 – pg. 10, l. 5); and para. [064] (pg. 13, ll. 12-23).
accepting data characterizing a geometric transformation relating the first sample grid and a desired sample grid;	*See, e.g.,* para. [010] (pg. 2, ll. 16-17); para. [018] (pg. 3, ll. 11-16); and FIG. 1, numeral 122.
determining a measure of scale relating the first sample grid and the desired sample grid from the data characterizing the geometric transformation;	*See, e.g.,* para. [011] (pg. 2, ll. 18-19); para. [018] (pg. 3, ll. 11-16); and para. [057] (pg. 11, ll. 12-25).
computing a filter for applying to the first image, including selecting characteristics of the filter according to the determined measure of scale and computing a spatially quantized representation of the filter, wherein a degree of spatial quantization of the filter depends on the determined measure of scale; and	*See, e.g.,* para. [07] (pg. 2, ll. 6-11); para. [012] (pg. 2, ll. 20-23); para. [018] (pg. 3, ll. 11-16); para. [019] (pg. 3, ll. 17-22); para. [048] (pg. 8, l. 32 – pg. 9, l. 11); para. [051] (pg. 9, l. 31 – pg. 10, l. 5); para. [052] (pg. 10, ll. 6-12); para. [053] (pg. 10, ll. 13-18); para. [056] (pg. 10, l. 32 – pg. 11, l. 10); and para. [066] (pg. 14, ll. 1-5).
storing the spatially quantized representation of the filter in a data structure comprising a location array that includes a plurality of elements representing fractional pixel locations based on a spatial quantization factor, wherein each element of the location array points to a sample array of filter values.	*See, e.g.,* para. [048] (pg. 8, l. 32 – pg. 9, l. 11); para. [051] (pg. 9, l. 31 – pg. 10, l. 5); para. [065] (pg. 13, ll. 24-33); para. [068] (pg. 14, ll. 13-28); para. [073] (pg. 16, ll. 4-19); and FIG. 4C, numerals 450, 460, and 462.

Claim 26

Claim Language	Support in Specification and Figures
Software stored on a computer-readable	*See, e.g.,* para. [07] (pg. 2, ll. 6-11); para. [018]

medium comprising instructions for causing a computer to:	(pg. 3, ll. 11-16); para. [019] (pg. 3, ll. 17-22); para. [037] (pg. 5, l. 30 – pg. 6, l. 10); and para. [076] (pg. 17, ll. 1-23).
compute a filter for applying in resampling to a first image sampled on a first sample grid, including computing a spatially quantized representation of the filter wherein a degree of spatial quantization of the filter depends on one or more factors including a measure of scale relating the first sample grid and a desired sample grid; and	*See, e.g.,* para. [07] (pg. 2, ll. 6-11); para. [012] (pg. 2, ll. 20-23); para. [018] (pg. 3, ll. 11-16); para. [019] (pg. 3, ll. 17-22); para. [048] (pg. 8, l. 32 – pg. 9, l. 11); para. [051] (pg. 9, l. 31 – pg. 10, l. 5); para. [052] (pg. 10, ll. 6-12); para. [053] (pg. 10, ll. 13-18); para. [056] (pg. 10, l. 32 – pg. 11, l. 10); and para. [066] (pg. 14, ll. 1-5).
store the spatially quantized representation of the filter in a data structure comprising a location array that includes a plurality of elements representing fractional pixel locations based on a spatial quantization factor, wherein each element of the location array points to a sample array of filter values.	*See, e.g.,* para. [048] (pg. 8, l. 32 – pg. 9, l. 11); para. [051] (pg. 9, l. 31 – pg. 10, l. 5); para. [065] (pg. 13, ll. 24-33); para. [068] (pg. 14, ll. 13-28); para. [073] (pg. 16, ll. 4-19); and FIG. 4C, numerals 450, 460, and 462.

Claim 29

Claim Language	Support in Specification and Figures
The software of claim 28 wherein computing the spatially quantized representation of the filter includes computing values of the filter each associated with one of a number of equal spatial domains of the filter.	*See, e.g.,* para. [012] (pg. 2, ll. 20-23); para. [048] (pg. 8, l. 32 – pg. 9, l. 11); and FIG. 4B, numeral 420.

Claim 38

Claim Language	Support in Specification and Figures
The software of claim 26 wherein the degree of spatial quantization of the filter depends on factors that further include characteristics of a computation device for performing the resampling.	*See, e.g.,* para. [017] (pg. 3, ll. 7-10); para. [035] (pg. 5, ll.10-22); para. [036] (para. 5, ll. 23-29); para. [063] (pg. 13, ll. 3-11); para. [066] (pg. 14, ll. 1-5); and FIG. 1, numeral 124.

Claim 41

Claim Language	Support in Specification and Figures
The software of claim 38 wherein the characteristics of the computational device include a processor characteristic.	*See, e.g.,* para. [017] (pg. 3, ll. 7-10); para. [035] (pg. 5, ll.10-22); para. [036] (para. 5, ll. 23-29); para. [063] (pg. 13, ll. 3-11); para. [066] (pg. 14, ll. 1-5); and FIG. 1, numeral 124.

Claim 42

Claim Language	Support in Specification and Figures
A system for resampling a first image sampled on a first sample grid comprising:	*See, e.g.,* para. [07] (pg. 2, ll. 6-11); para. [039] (pg. 6, ll. 22-29); para. [040] (pg. 6, l. 30 – pg. 7, l. 5); para. [046] (pg. 8, ll. 10-18); para. [051] (pg. 9, l. 31 – pg. 10, l. 5); and para. [064] (pg. 13, ll. 12-23).
means for computing a filter for applying to the first image, including means for computing a spatially quantized representation of the filter wherein a degree of spatial quantization of the filter depends on one or more factors including	*See, e.g.,* para. [07] (pg. 2, ll. 6-11); para. [012] (pg. 2, ll. 20-23); para. [018] (pg. 3, ll. 11-16); para. [019] (pg. 3, ll. 17-22); para. [035] (pg. 5, ll. 10-22); para. [048] (pg. 8, l. 32 – pg. 9, l. 11); para. [051] (pg. 9, l. 31 – pg. 10, l. 5);

a measure of scale relating the first sample grid and a desired sample grid; and	para. [052] (pg. 10, ll. 6-12); para. [053] (pg. 10, ll. 13-18); para. [056] (pg. 10, l. 32 – pg. 11, l. 10); para. [066] (pg. 14, ll. 1-5); and para. [076] (pg. 17, ll. 1-23).
means for storing the spatially quantized representation of the filter in a data structure comprising a location array that includes a plurality of elements representing fractional pixel locations based on a spatial quantization factor, wherein each element of the location array points to a sample array of filter values.	*See, e.g.,* para. [048] (pg. 8, l. 32 – pg. 9, l. 11); para. [051] (pg. 9, l. 31 – pg. 10, l. 5); para. [065] (pg. 13, ll. 24-33); para. [068] (pg. 14, ll. 13-28); para. [073] (pg. 16, ll. 4-19); para. [076] (pg. 17, ll. 1-23); and FIG. 4C, numerals 450, 460, and 462.

Claim 43

Claim Language	Support in Specification and Figures
Software stored on a computer-readable medium comprising instructions for causing a computer to:	*See, e.g.,* para. [07] (pg. 2, ll. 6-11); para. [018] (pg. 3, ll. 11-16); para. [019] (pg. 3, ll. 17-22); para. [037] (pg. 5, l. 30 – pg. 6, l. 10); and para. [076] (pg. 17, ll. 1-23).
accept data characterizing a geometric transformation relating a first sample grid for a first image and a desired sample grid;	*See, e.g.,* para. [010] (pg. 2, ll. 16-17); para. [018] (pg. 3, ll. 11-16); and FIG. 1, numeral 122.
determine a measure of scale relating the first sample grid and the desired sample grid from the data characterizing the geometric transformation;	*See, e.g.,* para. [011] (pg. 2, ll. 18-19); para. [018] (pg. 3, ll. 11-16); and para. [057] (pg. 11, ll. 12-25).
compute a filter for applying to the first image, including selecting characteristics of the filter according to the determined measure of scale and compute a spatially quantized	*See, e.g.,* para. [07] (pg. 2, ll. 6-11); para. [012] (pg. 2, ll. 20-23); para. [018] (pg. 3, ll. 11-16); para. [019] (pg. 3, ll. 17-22); para. [048] (pg. 8, l. 32 – pg. 9, l. 11); para. [051] (pg. 9, l. 31 –

representation of the filter, wherein a degree of spatial quantization of the filter depends on the determined measure of scale ; and	pg. 10, l. 5); para. [052] (pg. 10, ll. 6-12); para. [053] (pg. 10, ll. 13-18); para. [056] (pg. 10, l. 32 – pg. 11, l. 10); and para. [066] (pg. 14, ll. 1-5).
store the spatially quantized representation of the filter in a data structure comprising a location array that includes a plurality of elements representing fractional pixel locations based on a spatial quantization factor, wherein each element of the location array points to a sample array of filter values.	*See, e.g.,* para. [048] (pg. 8, l. 32 – pg. 9, l. 11); para. [051] (pg. 9, l. 31 – pg. 10, l. 5); para. [065] (pg. 13, ll. 24-33); para. [068] (pg. 14, ll. 13-28); para. [073] (pg. 16, ll. 4-19); and FIG. 4C, numerals 450, 460, and 462.

Claim 44

Claim Language	Support in Specification and Figures
A system for resampling a first image sampled on a first sample grid comprising:	*See, e.g.,* para. [07] (pg. 2, ll. 6-11); para. [039] (pg. 6, ll. 22-29); para. [040] (pg. 6, l. 30 – pg. 7, l. 5); para. [046] (pg. 8, ll. 10-18); para. [051] (pg. 9, l. 31 – pg. 10, l. 5); and para. [064] (pg. 13, ll. 12-23).
means for accepting data characterizing a geometric transformation relating the first sample grid and the desired sample grid;	*See, e.g.,* para. [010] (pg. 2, ll. 16-17); para. [018] (pg. 3, ll. 11-16); para. [076] (pg. 17, ll. 1-23); para. [077] (pg. 17, ll. 24-29); and FIG. 1, numeral 122.
means for determining a measure of scale relating the first sample grid and a desired sample grid from the data characterizing the geometric transformation;	*See, e.g.,* para. [011] (pg. 2, ll. 18-19); para. [018] (pg. 3, ll. 11-16); para. [057] (pg. 11, ll. 12-25); and para. [076] (pg. 17, ll. 1-23).
means for computing a filter for applying to the first image, including means for selecting	*See, e.g.,* para. [07] (pg. 2, ll. 6-11); para. [012] (pg. 2, ll. 20-23); para. [018] (pg. 3, ll. 11-16);

characteristics of the filter according to the determined measure of scale and computing a spatially quantized representation of the filter, wherein a degree of spatial quantization of the filter depends on the determined measure of scale; and	para. [019] (pg. 3, ll. 17-22); para. [048] (pg. 8, l. 32 – pg. 9, l. 11); para. [051] (pg. 9, l. 31 – pg. 10, l. 5); para. [052] (pg. 10, ll. 6-12); para. [053] (pg. 10, ll. 13-18); para. [056] (pg. 10, l. 32 – pg. 11, l. 10); para. [066] (pg. 14, ll. 1-5); and para. [076] (pg. 17, ll. 1-23).
means for storing the spatially quantized representation of the filter in a data structure comprising a location array that includes a plurality of elements representing fractional pixel locations based on a spatial quantization factor, wherein each element of the location array points to a sample array of filter values.	*See, e.g.,* para. [048] (pg. 8, l. 32 – pg. 9, l. 11); para. [051] (pg. 9, l. 31 – pg. 10, l. 5); para. [065] (pg. 13, ll. 24-33); para. [068] (pg. 14, ll. 13-28); para. [073] (pg. 16, ll. 4-19); para. [076] (pg. 17, ll. 1-23); and FIG. 4C, numerals 450, 460, and 462.

Claim 49

Claim Language	Support in Specification and Figures
The system of claim 48, wherein the means for computing the spatially quantized representation of the filter further comprises means for computing values of the filter, each associated with one of a number of equal spatial domains of the filter.	*See, e.g.,* para. [012] (pg. 2, ll. 20-23); para. [048] (pg. 8, l. 32 – pg. 9, l. 11); and FIG. 4B, numeral 420.

Claim 58

Claim Language	Support in Specification and Figures
The system of claim 42, wherein the degree of spatial quantization of the filter depends on factors that further include characteristics of a	*See, e.g.,* para. [017] (pg. 3, ll. 7-10); para. [035] (pg. 5, ll.10-22); para. [036] (para. 5, ll. 23-29); para. [063] (pg. 13, ll. 3-11); para.

computation device for performing the resampling.	[066] (pg. 14, ll. 1-5); and FIG. 1, numeral 124.

Claim 61

Claim Language	Support in Specification and Figures
The system of claim 58, wherein the characteristics of the computational device include a processor characteristic.	*See, e.g.,* para. [017] (pg. 3, ll. 7-10); para. [035] (pg. 5, ll.10-22); para. [036] (para. 5, ll. 23-29); para. [063] (pg. 13, ll. 3-11); para. [066] (pg. 14, ll. 1-5); and FIG. 1, numeral 124.

(6) Grounds of Rejection to be Reviewed on Appeal

The following grounds for rejection were presented by the Office in the Final Rejection mailed September 5, 2007:

(1) Claims 1-5, 18, 23, 26-29, 42-44, and 47-49 stand rejected under 35 U.S.C. §102(e) as allegedly being anticipated by U.S. Patent Application Publication No. 2003/0077000 to Blinn et al. ("Blinn et al."). Claims 6-8, 19, 30-32, 50-52, 62 and 66 stand rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over Blinn et al. in view of U.S. Patent No. 6,681,059 to Thompson et al. Claims 9-11, 24, 33-35, and 53-55 stand rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over Blinn et al. in view of U.S. Patent Publication No. 2004/0057634 to Mutoh. Claims 12, 13, 36, 37, 56, and 57 stand rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over Blinn et al. in view of Mutoh and in further view of U.S. Patent No. 6,111,566 to Chiba et al. Claims 20-22, 63-65, and 67-69 stand rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over Blinn et al. in view of Mutoh and in further view of U.S. Patent No. 6,886,034 to Blumberg.

(2) Claims 14-16, 38-40, and 58-60 stand rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over Blinn et al.

(3) Claims 17, 41, and 61 stand rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over Blinn et al. in view of U.S. Patent Application Publication No. 2003/0058216 to Lacroix et al. ("Lacroix et al.").

(7) Argument

Claim Rejections Under 35 U.S.C. §102(e) Based on Blinn et al.

Claims 1-5, 18, 23, 26-29, 42-44, and 47-49 stand rejected under 35 U.S.C. §102(e) as allegedly being anticipated by Blinn et al. The Office's contentions are respectfully traversed.

Claim 1 and Its Dependent Claims

Claim 1 recites (emphasis added) "...computing a filter for applying to the first image, including computing a spatially quantized representation of the filter wherein a degree of spatial quantization of the filter depends on one or more factors including a measure of scale relating the first sample grid and a desired sample grid; and storing the spatially quantized representation of the filter in a data structure comprising a location array that includes a plurality of elements representing fractional pixel locations based on a spatial quantization factor, wherein each element of the location array points to a sample array of filter values."

As exemplified in the specification, the location array includes elements representing fractional pixel locations. Also, each of the elements included in the location array further point

to a sample array of filter values. For example, the specification (para. [065]) discloses (emphasis added)...

> Referring to FIG. 4C, a data structure that holds the $K \cdot N \cdot M$ values of the filter $g(x) = f(x / K) / K$ includes an array 450 of M elements, each of which points to an array 460 of [$K \cdot N$] elements, where as discussed above $K \cdot N$ corresponds to the length of the filter in units of pixels. Each of these arrays holds samples of the filter with unit pixel spacing, but with different fractional pixel location of the center of the filter.

Thus, the specification discloses that the data structure includes an array of M elements, each of which points to an array of $K \cdot N$ samples of the filter.

The Office (Action of September 5, 2007 at pages 2-3) asserts that Blinn et al. teach (emphasis added) "storing the spatially quantized representation of the filter in a data structure comprising a location array that includes a plurality of elements representing fractional pixel locations based on a spatial quantization factor (weight of filter kernel), wherein each element of the location array points to a sample array of filter values (Fig. 3, para. [0040] – [0043], abstract)." The Office (*Id.* at page 13) further asserts that (emphasis added) "The prior art of Blinn et al. is using a filter kernel that is calculating output using fractional pixel locations (weighted original pixels) based on weight (spatial quantization factor) (Blinn Fig. 3 and para. [0041] – [0043]). Additionally, the Office (Advisory Action mailed December 6, 2007 at page 2) asserts that (emphasis added) "...Blinn et al. teach that a kernel filter that is computed from box, bilinear and bicubic filter (Fig. 4) and represented in array (spatially quantized representation) of values. In order to process this filter in computer environment (Fig. 1), it has to be stored in memory." Despite these assertions, Blinn et al. fail to disclose the claimed subject matter.

Blinn et al. do not teach storing a spatially quantized representation of the filter in a data structure. The Office cites to FIG. 3, which Blinn et al. describe as (emphasis added) "a diagram generally illustrating a conventional technique for performing image rescaling." FIGS. 3*a-d* of Blinn et al. do not disclose, teach, or suggest storing a spatially quantized representation of the filter in a data structure, as is claimed. Rather, FIGS. 3*a-d* disclose sampling a waveform to generate an image and then rescaling that image using a filter. Capturing and/or rescaling an image is not equivalent to storing a spatially quantized representation of a filter in a data structure. To the contrary, Blinn et al. (paras. [0040]-[0041]) teach that generating an image involves sampling a source, such as a waveform, at a predetermined interval. Further, Blinn et al. (paras. [0041]-[0043]) teach that rescaling involves computing an output pixel value of a target image by mapping a filter to a region of the source image. For example, Blinn et al. (para. [0042]) disclose (emphasis added)...

> As the next step in the rescaling process, a filter kernel is mapped to the sampled image 124 by applying the inverse of the calculated transform (T^{-1}) to the sampled image 124.

Mapping a filter kernel to an image is not equivalent to computing a spatially quantized representation of the filter and storing the spatially quantized representation of the filter in a data structure. Rather, mapping a filter kernel to an image relates to applying an existing filter kernel to an image. Accordingly, Blinn et al. do not disclose storing a spatially quantized representation of a filter in a data structure comprising a location array, as recited in claim 1.

Also, with respect to FIG. 4, Blinn et al. do not disclose that a filter kernel is computed from box, bilinear and bicubic filters and that a spatially quantized representation of the filter kernel is represented in an array of values, as the Office asserts (Advisory Action mailed

December 6, 2007 at page 2). Rather, Blinn et al. (para. [0044]) teach that box, bilinear, and bicubic are common types of filter kernels that can be applied to a source image to perform conventional rescaling. Moreover, Blinn et al. do not disclose – in FIG. 4 or elsewhere – generating a spatially quantized representation for any of the disclosed filter kernels. Further, the Office asserts that a filter kernel is represented as an array of values. However, the Office (Advisory Action mailed December 6, 2007 at page 2) does not assert that Blinn et al. disclose a filter kernel represented as a location array that includes a plurality of elements representing fractional pixel locations based on a spatial quantization factor, wherein each element of the location array points to a sample array of filter values, as is claimed.

The Abstract of Blinn et al., to which the Office also cites, discloses computing an optimal filter kernel. For example, Blinn et al. (Abstract) disclose (emphasis added)...

> An optimal filter kernel, formed by convolving a box filter with a filter of fixed integer width and unity area, is used to perform image resizing and reconstruction. The optimal filter has forced zeros at locations along a frequency scale corresponding to the reciprocal of the spacing of one or more pixels that comprise a source image to be resized. When a rescale value for a source image is selected, the optimal filter kernel is computed, mapped to the source image, and centered upon a location within the source image corresponding to the position of an output pixel to be generated.

Thus, Blinn et al. teach computing an optimal filter kernel by convolving a box filter with a filter of fixed integer width and unity area. Blinn et al. do not, however, teach computing a spatially quantized representation of a filter. To the contrary, Blinn et al. disclose only a frequency scale associated with the optimal filter kernel. Further, Blinn et al. do not disclose, teach, or suggest storing a spatially quantized representation of a filter in a data structure comprising a location

array, as is claimed. Moreover, Blinn et al. do not disclose or suggest storing a filter to include a location array, each element of which points to a sample array of filter values.

Blinn et al. (para. [0042]) also disclose that (emphasis added) "A filter kernel is an array of values that define the characteristics of the filter to be used for processing the pixels of the sampled image...." As discussed above, however, Blinn et al. do not disclose that the array of values comprises a location array that includes a plurality of elements representing fractional pixel locations based on a spatial quantization factor, wherein each element of the location array points to a sample array of filter values. To the contrary, Blinn et al. (para. [0011]) disclose (emphasis added)...

> Upon mapping the filter, the output pixel values of the resized image are calculated by multiplying the pixel value for each pixel under the kernel by the area of the filter kernel surrounding the pixel. The products are then summed to reveal the output pixel value, and placed into the output image buffer. This operation is performed repeatedly on each pixel of the source image until the resized output image is fully generated.

Thus, Blinn et al. teach applying the same filter – and thus the same filter values – to each pixel of the source image. As such, the filter disclosed by Blinn et al. has a single set of values. Therefore, Blinn et al. do not teach a representation of the filter that has a location array, each element of which further points to a sample array of filter values. Accordingly, Blinn et al. fail to disclose, teach, or suggest the location array recited in claim 1.

Additionally, the Office (Action of September 5, 2007 at page 13) asserts that (emphasis added)...

> The prior art of Blinn et al. is using filter kernel that is calculating output using fractional pixel locations (weighted original pixels) based on weight (spatial quantization factor) (Blinn Fig. 3 and para [0041]-[0043]).

The Office (Advisory Action mailed December 6, 2007 at page 2) also asserts that fractional pixel locations are "combinations of weighted original pixel location". The Office's assertion that Blinn et al. disclose using fractional pixel locations in the form of weighted original pixels is incorrect.

First, Blinn et al. disclose using actual pixel locations – not fractional pixel locations – that appear under the filter. For example, Blinn et al. (para. [0043]) disclose (emphasis added)...

> The interpolation procedure is performed by multiplying the intensity values of the pixels that lie underneath the kernel with the weight, or height, of the kernel at each respective position of the pixels. For example, in FIG. 3*d*, the filter kernel 136 is centered such that four pixels 138 – each containing color intensity information P1 thru P4 – lie underneath the kernel. The output pixel value 139 is calculated by multiplying the pixel values P1 thru P4 with the weight of the filter kernel $K(X_{P1})$ thru $K(X_{P2})$, where X is the respective position of the pixels underneath the kernel.

Thus, Blinn et al. do not disclose the use of fractional pixel locations. To the contrary, Blinn et al. teach that the pixel value at an actual pixel location is multiplied by the corresponding weight (or height) of the filter. Combinations of weighted original pixel values do not constitute the use of fractional pixel locations. As such, Blinn et al. do not disclose determining or otherwise using a fractional pixel location.

Second, assuming *arguendo* that Blinn et al. did disclose using a filter kernel that calculates output using fractional pixel locations, which Blinn et al. do not, Blinn et al. still would not disclose storing a spatially quantized representation of the filter in a data structure

comprising a location array that includes a plurality of elements representing fractional pixel locations, as is claimed. Using fractional pixel locations to calculate an output value of an image is not equivalent to storing a representation of a filter that includes a plurality of elements representing fractional pixel locations. For example, Blinn et al. (para. [0043]) clearly disclose that only the output value, which corresponds to an actual pixel location in the output image, is computed and "...placed into a memory location allocated for the output image." Blinn et al. do not disclose, teach, or suggest storing an array that includes a plurality of elements representing fractional pixel locations. Moreover, Blinn et al. do not disclose, teach, or suggest a spatially quantized representation of a filter that includes such an array.

Accordingly, Blinn et al. do not disclose, teach, or suggest storing the spatially quantized representation of the filter in a data structure comprising a location array that includes a plurality of elements representing fractional pixel locations based on a spatial quantization factor, wherein each element of the location array points to a sample array of filter values, as is claimed.

For at least these reasons, claim 1 is allowable over Blinn et al. Additionally, Thompson et al., Mutoh, and Chiba et al. taken separately or in combination fail to cure the deficiencies of Blinn et al. Claims 2-17 depend from claim 1 and are therefore allowable for at least the reasons discussed with respect to claim 1. Claims 26 and 42 include subject matter similar to that of claim 1. Thus, claims 26 and 42 are allowable for at least the reasons discussed with respect to claim 1. Further, claims 27-41 depend from claim 26 and claims 47-61 depend from claim 42. Therefore, claims 27-41 and claims 47-61 are allowable based at least on claims 26 and 42, respectively.

Claim 5

Claim 5 recites (emphasis added) "The method of claim 4 wherein computing the spatially quantized representation of the filter includes computing values of the filter each associated with one of a number of equal spatial domains of the filter."

The Office (Action of September 5, 2007 at page 3) asserts that "...Blinn et al. teaches computing the spatially quantized representation of the filter includes computing values of the filter each associated with on [sic] of a number of equal spatial domains of the filter (Fig. 3, para. [0043])." Blinn et al. fail to disclose the claimed subject matter.

FIGS. 3*a-d* of Blinn et al. do not disclose, teach, or suggest computing values of a filter each associated with one of a number of equal spatial domains of the filter. Rather, FIGS. 3*a-d* disclose sampling a waveform to generate an image and then rescaling that image using a filter. Further, paragraph [0043] of Blinn et al. relates to "...the process of pixel interpolation, the final step of the resealing [sic] process." For example, Blinn et al. disclose (emphasis added)...

> The output pixel value 139 is calculated by multiplying the pixel values P1 thru P4 with the weight of the filter kernel $K(X_{P1})$ thru $K(X_{P2})$, where X is the respective position of the pixels underneath the kernel. These values are then summed to reveal the total output pixel value 139, and placed into a memory location allocated for the output image.

Thus, the cited portion of Blinn et al. teaches computing output pixel values corresponding to an output image. Computing values corresponding to an image is not equivalent to computing values of a filter. Accordingly, Blinn et al. do not disclose that computing the spatially quantized representation of the filter includes computing values of the filter each associated with one of a number of equal spatial domains of the filter, as is claimed.

For at least these reasons, claim 5 also is allowable over Blinn et al. based on its own merits. Claims 29 and 49 include subject matter similar to that of claim 5, and thus also are allowable for at least the reasons discussed with respect to claim 5.

Claim 18 and Its Dependent Claims

Claim 18 recites (emphasis added) "...computing a filter for applying to the first image, including selecting characteristics of the filter according to the determined measure of scale and computing a spatially quantized representation of the filter, wherein a degree of spatial quantization of the filter depends on the determined measure of scale; and storing the spatially quantized representation of the filter in a data structure comprising a location array that includes a plurality of elements representing fractional pixel locations based on a spatial quantization factor, wherein each element of the location array points to a sample array of filter values."

As discussed above with respect to claim 1, Blinn et al. do not disclose, teach, or suggest storing a spatially quantized representation of a filter in a data structure comprising a location array. Also as discussed above with respect to claim 1, Blinn et al. do not disclose a location array that includes a plurality of elements representing fractional pixel locations based on a spatial quantization factor, wherein each element of the location array points to a sample array of filter values.

Nonetheless, the Office (Action of September 5, 2007 at page 3) asserts that Blinn et al. disclose each and every element of claim 18. In setting forth the rejection of claim 18, the Office (*Id.*) states (emphasis added) "With respect to claim 18, please refer to rejection for claim 3." However, the rejection of claim 3 (*Id.*) is based on FIG. 3 and para. [0040]. As both FIG. 3 and

para. [0040] were cited in the rejection of claim 1, the rejection of claim 3 does not add any additional subject matter.

Blinn et al. (para. [0040]) disclose using a transform (T) to create a digital representation of a source object, such as by sampling a captured image signal. Further, Blinn et al. (*Id.*) disclose that FIGS. 3*a-d* illustrate a typical rescale operation. As discussed above with respect to claim 1, creating a digital representation of a source object and rescaling such a digital representation are not equivalent to storing a spatially quantized representation of a filter in a location array. Accordingly, Blinn et al. fail to disclose, teach, or suggest storing the spatially quantized representation of the filter in a data structure comprising a location array that includes a plurality of elements representing fractional pixel locations based on a spatial quantization factor, wherein each element of the location array points to a sample array of filter values, as recited in claim 18.

For at least these reasons, claim 18 is allowable over Blinn et al. Additionally, Blumberg fails to cure the deficiencies of Blinn et al. Claims 19-22 depend from claim 18 and are therefore allowable for at least the reasons discussed with respect to claim 18. Claims 43 and 44 include subject matter similar to that of claim 18. Thus, claims 43 and 44 are allowable for at least the reasons discussed with respect to claim 18. Further, claims 62-65 depend from claim 43 and claims 66-69 depend from claim 44. Therefore, claims 62-65 and claims 66-69 are allowable based at least on claims 43 and 44, respectively.

Additionally, the Office's explanation of how the Blinn et al. reference satisfies the elements of the pending claims – including claims 1 and 18 – is legally deficient. For example, MPEP §2271 Final Action states (emphasis added)…

> In making the final rejection, all outstanding grounds of rejection of record should be carefully reviewed and any grounds or rejection relied on should be reiterated. The grounds of rejection must (in the final rejection) be clearly developed to such an extent that the patent owner may readily judge the advisability of an appeal. However, where a single previous Office action contains a complete statement of a ground of rejection, the final rejection may refer to such a statement and also should include a rebuttal of any arguments raised in the patent owner's response.

The Office (Action of September 5, 2007 at pages 2-3) asserts that Blinn et al. teach (emphasis added) "storing the spatially quantized representation of the filter in a data structure comprising a location array that includes a plurality of elements representing fractional pixel locations based on a spatial quantization factor, wherein each element of the location array points to a sample array of filter values", but supports this assertion with only a single parenthetical "(weight of filter kernel)" and a cite to Blinn et al. The Office (Advisory Action of December 6, 2007 at page 2) reiterates that (emphasis added) "The prior art of Blinn et al. teach that fractional pixel location (combinations of weighted original pixel location)."

The Office does not provide any explanation as to how the weighted values of the actual pixel locations under the filter represent fractional pixel locations. Moreover, the Office does not approach the issue of how a plurality of the "weighted original pixel location" are stored as elements in a location array. Rather, the Office's rebuttal of argument (Action of September 5, 2007 at page 13 and Advisory Action of December 6, 2007 at page 2) consists of a single sentence directed to applying a filter kernel to an image to calculate a single output corresponding to the target image. Accordingly, the Office's grounds of rejection are not clearly developed.

For all of the above reasons, it is respectfully requested that the ground of rejection (1) be overturned.

Claim Rejections Under 35 U.S.C. §103(a) Based on Blinn et al.

Claims 14-16, 38-40, and 58-60 stand rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over Blinn et al. The rejections and the underlying reasoning are respectfully traversed.

Claim 14

Claim 14 recites (emphasis added) "The method of claim 1 wherein the degree of spatial quantization of the filter depends on factors that further include characteristics of a computation device for performing the resampling."

The Office (Action of September 5, 2007 at page 9) states (emphasis added) "Blinn et al. does not expressly disclose that the degree of spatial quantization of the filter depends on factors that further include characteristics of a computation device…for performing the resampling." Thus, the Office concedes that Blinn et al. do not disclose the claimed subject matter. Nonetheless, the Office (*Id.*) asserts that (emphasis added)…

> When a software is made, it always depend on characteristics of a computation device include a memory size. It should have minimum system requirement. At the time of the invention it would have been obvious to a person of ordinary skill in the art to create filter depend on characteristics of a computation device in method of Blinn et al.

Further, the Office (Advisory Action of December 6, 2007 at page 2) states (emphasis added)…

> Applicants argue on page 21 of the response that the disclosure of Blinn et al. do not disclose degree of spatial quantization of filter depends on one or more factors

> including a measure of scale and characteristics of computation device. The examiner agrees. But degree of spatial quantization of filter related to the complexity of filter and one in the ordinary skilled in the art would know that complexity of filter depend on characteristics of computation device such as memory size.

Minimum system requirements and filter complexity, however, do not dictate that the degree of spatial quantization of the filter depend on characteristics of a computation device. Thus, the Office's assertion of common knowledge is incorrect and inappropriate.

As recited in claims 1 and 14, the degree of spatial quantization of the filter depends on one or more factors including a measure of scale and characteristics of a computation device. The specification (para. [063]) presents an example characteristic of a computation device, stating (emphasis added) "The spatial quantization factor is then chosen so that the number of spatially quantized samples is not so large as to result in poor cache behavior." The specification (*Id.*) also discloses other computation factors, including the computation speed of the target processor.

Thus, the performance of a computation device can impact or be impacted by the degree of spatial quantization of the filter. Contrary to the Office's assertion, however, the complexity of a filter does not depend on characteristics of a computation device. Rather, a filter that exhibits poor performance when applied by a computation device can nevertheless be applied by that computation device. Further, that a software application, as the Office asserts, should have a minimum system requirement is immaterial. Ensuring that minimum system requirements are available for a software application does not disclose, teach, or suggest that a degree of spatial quantization of a filter depends on characteristics of a computation device. Thus, the general

knowledge upon which the Office relies fails to cure the deficiencies of Blinn et al. – deficiencies that the Office recognizes.

Second, the Office does not state that it is taking official notice regarding the degree of spatial quantization of the filter depending on factors that further include characteristics of a computation device for performing the resampling. Nonetheless, taking official notice with respect to claim 14 is inappropriate because the subject matter is not capable of instant and unquestionable demonstration as being well-known. MPEP §2144.03 A. unequivocally states that official notice without documentary evidence should rarely be relied on when an application is under final rejection. MPEP §2144.03 A. also states (emphasis added)…

> It would not be appropriate for the examiner to take official notice of facts without citing a prior art reference where the facts asserted to be well known are not capable of instant and unquestionable demonstration as being well-known. For example, assertions of technical facts in the areas of esoteric technology or specific knowledge of the prior art must always be supported by citation to some reference work recognized as standard in the pertinent art. *In re Ahlert*, 424 F.2d at 1091, 165 USPQ at 420-21.

The Office has failed to comply with this clearly enunciated requirement.

Further, MPEP §2144.03 B states…

> **If Official Notice Is Taken of a Fact, Unsupported by Documentary Evidence, the Technical Line of Reasoning Underlying a Decision To Take Such Notice Must Be Clear and Unmistakable**
> …If such notice is taken, the basis for such reasoning must be set forth explicitly. The examiner must provide specific factual findings predicated on sound technical and scientific reasoning to support his or her conclusion of common knowledge. See *Soli*, 317 F.2d at 946, 37 USPQ at 801; *Chevenard*, 139 F.2d at 713, 60 USPQ at 241. The applicant should be presented with the explicit basis on

> which the examiner regards the matter as subject to official notice so as to adequately traverse the rejection in the next reply after the Office action in which the common knowledge statement was made.

The Office also fails to provide an adequate technical line of reasoning, as required when taking official notice without documentary support. For example, the Office does not provide any support for the assertion that performing image processing without conflict with the computation device would have motivated a person of ordinary skill in the art to make the degree of spatial quantization of the filter depend on factors that include characteristics of a computation device for performing the resampling. The Office also does not indicate how this result would be achieved or that such a practice was well-known.

For at least these reasons, claim 14 is allowable based on its own merits. Claims 15-17 depend from claim 14 and are therefore allowable for at least the reasons discussed with respect to claim 14. Further, claims 38 and 58 include subject matter similar to that of claim 14. Thus, claims 38 and 58 are allowable for at least the reasons discussed with respect to claim 14. Additionally, claims 39-41 depend from claim 38 and claims 59-61 depend from claim 58. Therefore, claims 39-41 and claims 59-61 are allowable based at least on claims 38 and 58, respectively.

For all of the above reasons, it is respectfully requested that the ground of rejection (2) be overturned.

Claim Rejections Under 35 U.S.C. §103(a) Based on Blinn et al. and Lacroix et al.

Claims 17, 41, and 61 stand rejected under 35 U.S.C. §103(a) as allegedly being unpatentable over Blinn et al. in view of Lacroix et al. The rejections and the underlying reasoning are respectfully traversed.

Claim 17

Claim 17 recites (emphasis added) "The method of claim 14 wherein the characteristics of the computational device include a processor characteristic." As discussed with respect to claims 1 and 14, the characteristics relate to a degree of spatial quantization of a filter that can be applied to an image. The Office (Action of September 5, 2007 at page 10) concedes that (emphasis added) "Blinn et al. does not disclose expressly that the characteristics of the computational device include a processor characteristic." Nonetheless, the Office (*Id.*) appears to assert that Lacroix et al. teach the claimed subject matter and that it would have been obvious to combine the Blinn et al. with Lacroix et al.

For example, the Office (*Id.*) states that (emphasis added) "The suggestion/motivation for doing so would have been that filter can be optimized for user (processing speed, image quality). Therefore, it would have been obvious to combine Chiba et al. with Blinn et al. and Mutoh to obtain the invention as specified in claim 17." It is noted that the Office does not reject claim 17 under a combination of Blinn et al., Chiba et al., and Mutoh. Although this issue was raised on page 24, lines 6-11 of the reply to the final action filed on November 5, 2007, the Advisory Action mailed on December 6, 2007 does not correct the inconsistency. Nonetheless, it is presumed for the sake of traversing the rejection that the intended combination is Blinn et al. and

Lacroix et al. since no citations to Chiba et al. or Mutoh are provided in the rejection of claims 17, 41, and 61.

No motivation to combine Blinn et al. with Lacroix et al. can be found in the references. For example, Blinn et al. (para. [0037]) disclose (emphasis added) "The present invention relates to a method and system for resizing images such that the unsightly effect of ripples does not occur in the generated output image." In contrast, Lacroix et al. (para. [0002]) disclose (emphasis added) "Embodiments of the present invention relate generally to haptic feedback interface devices used with a host computer system, and more particularly to data filters for haptic feedback interface devices." The portion of Lacroix et al. (paras. [0048]-[0049]) cited by the Office teaches filtering haptic feedback data (force or tactile feedback) so that redundant data is not transmitted. Lacroix et al. do not disclose, teach, or suggest image processing, much less applying a filter to an image. Accordingly, the Blinn et al. and Lacroix et al. references are wholly unrelated. Therefore, no suggestion to combine the references can be found in either Blinn et al. or Lacroix et al.

Further, MPEP §2141 provides that in order to rely on a reference under 35 U.S.C. §103, the reference must be analogous prior art. MPEP §2141.01(a) II. also states (emphasis added)...

> While Patent Office classification of references and the cross-references in the official search notes of the class definitions are some evidence of "nonanalogy" or "analogy" respectively, the court has found "the similarities and differences in structure and function of the inventions to carry far greater weight."

Lacroix et al. is directed to a data filter for haptic feedback devices having low-bandwidth communication links. The data filter disclosed by Lacroix et al. is not spatially quantized and it is not used for resampling an image. To the contrary, Lacroix et al. does not address image

processing. Accordingly, Lacroix et al. does not constitute analogous art for purposes of 35 U.S.C. §103.

For at least these reasons, claim 17 also is allowable based on its own merits. Claims 41 and 61 include subject matter similar to that of claim 17, and therefore also are allowable for at least the same reasons.

For all of the above reasons, it is respectfully requested that the ground of rejection (3) be overturned.

Concluding Comments

In view of the above remarks, claims 1-22, 26-44, and 47-69 should be in condition for allowance, and it is respectfully requested that the grounds of rejection be overturned. Please apply $500 for the brief fee and any additional charges or credits to deposit account 06-1050.

Respectfully submitted,

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Appendix of Claims

1. A method for resampling a first image sampled on a first sample grid comprising:

computing a filter for applying to the first image, including computing a spatially quantized representation of the filter wherein a degree of spatial quantization of the filter depends on one or more factors including a measure of scale relating the first sample grid and a desired sample grid; and

storing the spatially quantized representation of the filter in a data structure comprising a location array that includes a plurality of elements representing fractional pixel locations based on a spatial quantization factor, wherein each element of the location array points to a sample array of filter values.

2. The method of claim 1 further comprising:

computing a desired image sampled on the desired sample grid, including computing samples of the desired image according to an application of the spatially quantized representation of the filter to the first image.

3. The method of claim 1 further comprising:

accepting data characterizing a geometric transformation relating the first sample grid and the desired sample grid; and

computing the measure of scale from the data characterizing the geometric transformation.

4. The method of claim 1 wherein computing the filter includes selecting the number of spatial samples of the spatially quantized representation of the filter.

5. The method of claim 4 wherein computing the spatially quantized representation of the filter includes computing values of the filter each associated with one of a number of equal spatial domains of the filter.

6. The method of claim 1 wherein computing the filter for applying to the first image includes selecting a parametric family of filters.

7. The method of claim 6 wherein computing the filter for applying to the first image includes determining parameter values for the filter.

8. The method of claim 7 wherein determining the parameter values for the filter includes computing the parameters values based on factors including the measure of scale.

9. The method of claim 1 further comprising accepting a user input specifying a characteristic of the resampling, and using the user input in the computing of the filter for applying to the first image.

10. The method of claim 9 wherein accepting the user input includes accepting an input related to a characteristic of the desired image.

11. The method of claim 10 wherein the characteristic of the desired image includes a visual characteristic of the desired image.

12. The method of claim 9 wherein accepting the user input includes accepting an input related to a processing characteristic for the resampling.

13. The method of claim 12 wherein the input related to the processing characteristic includes an input related to a processing speed.

14. The method of claim 1 wherein the degree of spatial quantization of the filter depends on factors that further include characteristics of a computation device for performing the resampling.

15. The method of claim 14 wherein the characteristics of the computational device include a memory size characteristic.

16. The method of claim 15 wherein the memory size characteristic includes a cache memory size.

17. The method of claim 14 wherein the characteristics of the computational device include a processor characteristic.

18. A method for resampling a first image sampled on a first sample grid comprising:

accepting data characterizing a geometric transformation relating the first sample grid and a desired sample grid;

determining a measure of scale relating the first sample grid and the desired sample grid from the data characterizing the geometric transformation;

computing a filter for applying to the first image, including selecting characteristics of the filter according to the determined measure of scale and computing a spatially quantized representation of the filter, wherein a degree of spatial quantization of the filter depends on the determined measure of scale ; and

storing the spatially quantized representation of the filter in a data structure comprising a location array that includes a plurality of elements representing fractional pixel locations based on a spatial quantization factor, wherein each element of the location array points to a sample array of filter values.

19. The method of claim 18 wherein the filter is a member of a parametric family of filters and selecting the characteristics of the filter includes selecting parameter values for the filter according to the determined measure of scale.

20. The method of claim 18 wherein the data characterizing the geometric transformation includes data characterizing an affine transformation.

21. The method of claim 18 wherein the data characterizing the geometric transformation includes a minification factor.

22. The method of claim 18 wherein the data characterizing the geometric transformation includes a magnification factor.

23. – 25. (Canceled)

26. Software stored on a computer-readable medium comprising instructions for causing a computer to:

compute a filter for applying in resampling to a first image sampled on a first sample grid, including computing a spatially quantized representation of the filter wherein a degree of spatial quantization of the filter depends on one or more factors including a measure of scale relating the first sample grid and a desired sample grid; and

store the spatially quantized representation of the filter in a data structure comprising a location array that includes a plurality of elements representing fractional pixel locations based on a spatial quantization factor, wherein each element of the location array points to a sample array of filter values.

27. The software of claim 26 wherein the instructions further cause the computer to:

accept data characterizing a geometric transformation relating the first sample grid and the desired sample grid; and

compute the measure of scale from the data characterizing the geometric transformation.

28. The software of claim 26 wherein computing the filter includes selecting the number of spatial samples of the spatially quantized representation of the filter.

29. The software of claim 28 wherein computing the spatially quantized representation of the filter includes computing values of the filter each associated with one of a number of equal spatial domains of the filter.

30. The software of claim 26 wherein computing the filter for applying to the first image includes selecting a parametric family of filters.

31. The software of claim 30 wherein computing the filter for applying to the first image includes determining parameter values for the filter.

32. The software of claim 31 wherein determining the parameter values for the filter includes computing the parameter values based on factors including the measure of scale.

33. The software of claim 26 further comprising accepting a user input specifying a characteristic of the resampling, and using the user input in the computing of the filter for applying to the first image.

34. The software of claim 33 wherein accepting the user input includes accepting an input related to a characteristic of the desired image.

35. The software of claim 34 wherein the characteristic of the desired image includes a visual characteristic of the desired image.

36. The software of claim 33 wherein accepting the user input includes accepting an input related to a processing characteristic for the resampling.

37. The software of claim 36 wherein the input related to the processing characteristic includes an input related to a processing speed.

38. The software of claim 26 wherein the degree of spatial quantization of the filter depends on factors that further include characteristics of a computation device for performing the resampling.

39. The software of claim 38 wherein the characteristics of the computational device include a memory size characteristic.

40. The software of claim 39 wherein the memory size characteristic includes a cache memory size.

41. The software of claim 38 wherein the characteristics of the computational device include a processor characteristic.

42. A system for resampling a first image sampled on a first sample grid comprising:

means for computing a filter for applying to the first image, including means for computing a spatially quantized representation of the filter wherein a degree of spatial quantization of the filter depends on one or more factors including a measure of scale relating the first sample grid and a desired sample grid; and

means for storing the spatially quantized representation of the filter in a data structure comprising a location array that includes a plurality of elements representing fractional pixel locations based on a spatial quantization factor, wherein each element of the location array points to a sample array of filter values.

43. Software stored on a computer-readable medium comprising instructions for causing a computer to:

accept data characterizing a geometric transformation relating a first sample grid for a first image and a desired sample grid;

determine a measure of scale relating the first sample grid and the desired sample grid from the data characterizing the geometric transformation;

compute a filter for applying to the first image, including selecting characteristics of the filter according to the determined measure of scale and compute a spatially quantized representation of the filter, wherein a degree of spatial quantization of the filter depends on the determined measure of scale ; and

store the spatially quantized representation of the filter in a data structure comprising a location array that includes a plurality of elements representing fractional pixel locations based on a spatial quantization factor, wherein each element of the location array points to a sample array of filter values.

44. A system for resampling a first image sampled on a first sample grid comprising:

means for accepting data characterizing a geometric transformation relating the first sample grid and the desired sample grid;

means for determining a measure of scale relating the first sample grid and a desired sample grid from the data characterizing the geometric transformation;

means for computing a filter for applying to the first image, including means for selecting characteristics of the filter according to the determined measure of scale and computing a spatially quantized representation of the filter, wherein a degree of spatial quantization of the filter depends on the determined measure of scale; and

means for storing the spatially quantized representation of the filter in a data structure comprising a location array that includes a plurality of elements representing fractional pixel locations based on a spatial quantization factor, wherein each element of the location array points to a sample array of filter values.

45. – 46. (Canceled)

47. The system of claim 42, further comprising:

means for accepting data characterizing a geometric transformation relating the first sample grid and the desired sample grid; and

means for computing the measure of scale from the data characterizing the geometric transformation.

48. The system of claim 42, wherein the means for computing the filter further comprises means for selecting the number of spatial samples of the spatially quantized representation of the filter.

49. The system of claim 48, wherein the means for computing the spatially quantized representation of the filter further comprises means for computing values of the filter, each associated with one of a number of equal spatial domains of the filter.

50. The system of claim 42, wherein the means for computing the filter for applying to the first image further comprises means for selecting a parametric family of filters.

51. The system of claim 50, wherein the means for computing the filter for applying to the first image further comprises means for determining parameter values for the filter.

52. The system of claim 51, wherein the means for determining the parameter values for the filter is configured to compute the parameter values based on factors including the measure of scale.

53. The system of claim 42, further comprising:

means for accepting a user input specifying a characteristic of the resampling and means for using the user input in the computing of the filter for applying to the first image.

54. The system of claim 53, wherein the means for accepting the user input is configured to accept an input related to a characteristic of the desired image.

55. The system of claim 54, wherein the characteristic of the desired image includes a visual characteristic of the desired image.

56. The system of claim 53, wherein the means for accepting the user input is configured to accept an input related to a processing characteristic for the resampling.

57. The system of claim 56, wherein the input related to the processing characteristic includes an input related to a processing speed.

58. The system of claim 42, wherein the degree of spatial quantization of the filter depends on factors that further include characteristics of a computation device for performing the resampling.

59. The system of claim 58, wherein the characteristics of the computational device include a memory size characteristic.

60. The system of claim 59, wherein the memory size characteristic includes a cache memory size.

61. The system of claim 58, wherein the characteristics of the computational device include a processor characteristic.

62. The software of claim 43, wherein the filter is a member of a parametric family of filters and selecting characteristics of the filter includes selecting parameter values for the filter according to the determined measure of scale.

63. The software of claim 43, wherein the data characterizing the geometric transformation includes data characterizing an affine transformation.

64. The software of claim 43, wherein the data characterizing the geometric transformation includes a minification factor.

65. The software of claim 43, wherein the data characterizing the geometric transformation includes a magnification factor.

66. The system of claim 44, wherein the filter is a member of a parametric family of filters and the means for selecting characteristics of the filter is configured to select parameter values for the filter according to the determined measure of scale.

67. The system of claim 44, wherein the data characterizing the geometric transformation includes data characterizing an affine transformation.

68. The system of claim 44, wherein the data characterizing the geometric transformation includes a minification factor.

69. The system of claim 44, wherein the data characterizing the geometric transformation includes a magnification factor.

Evidence Appendix

None.

Related Proceedings Appendix

None.